ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 8, Issue, 07, pp.33884-33888, July, 2016

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

DIVERSITY OF PHYTOPLANKTON AND AQUATIC MACROPHYTES IN AMRUTHAPUR LAKE OF NIZAMABAD DISTRICT IN TELANGANA

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ARTICLE INFO

Article History:
Received 21st April, 2016
Received in revised form
10th May, 2016
Accepted 14th June, 2016
Published online 16th July, 2016

Key words:

Diversity of Phytoplankton, Aquatic Macrophytes, Amruthapur Lake, Nizamabad District, Telangana.

ABSTRACT

Phytoplanktonic algae and aquatic macrophytes play dynamic role in fresh water ecosystem. The lake, locally called as Amruthapur lake is located in the vicinity of Telangana University campus, Amruthapur village, Dichpally. This lake was chosen to enumerate diversity of phytoplankton's and distribution of aquatic macrophytes by seasonal variation for which collections were analyzed for a period of one year during August, 2014-October, 2015. For experimental studies surface and bottom water samples were collected from differenent sites of Amruthapur lake. The observations revealed that Amruthapur lake showed more abundance of phytoplanktonic algae belonging to class *Chlorophyceae, Bacillariophyceae* and *Cyanophyceae.* Aquatic macrophytes found were categorized into three morpho-ecological forms such as free floating, submerged and emergent forms. In this study a total of 42 algal species and 22 aquatic macrophytes were recorded.

Citation: Ramesh, B. and Aruna, M. 2016. "Diversity of phytoplankton and aquatic Macrophytes in Amruthapur lake of Nizamabad district in Telangana", *International Journal of Current Research*, 8, (07), 33884-33888.

INTRODUCTION

Studies related to aquatic and wetland flora and phytoplanktonic distribution were Globally studied earlier by Mirashi, 1954; Sen and Chaterjee, 1959; Vyas, 1964; Mishra, 1974; Baruah and Baruah, 2000; Deshkar, 2008; Chandra et al. 2008 and Aruna and Srinivas, 2013. Floristic list of a particular area gives a reliable background information about the species diversity in a community as each algal species has its own specific ecological amplitude and the same indicates the ecological nature of the habitat. Studies on the seasonality of Indian fresh water plankton were initiated by Sewell in 1934. The aquatic diversity is highly sensitive and is influenced by various factors. However, the organisms in the lake ecosystems are indicators of changes that occur due to various anthropogenic activities, for example, pollution, climate change etc. Phytoplanktons and some of aquatic macrophytes are the easiest food source for most of the aquatic beings like zooplanktons, fishes and thus are the basic food producers in any aquatic ecosystem. Generally fresh water ecosystems are two types: (a) lotic; and (b) lentic; lotic water ecosystem includes streams, canals, waterfalls and rivers, and lentic water ecosystem includes ponds, reservoirs, lakes, pools and agricultural fields like that of paddy. In the present investigation we have selected lentic water ecosystem to enumerate diversity of phytoplankton and aquatic macrophytes. Fresh water ecosystems are differentiated into various types of planktons (free floating), benthic (attached to sediments) and epiphytic algae attached to hydrophytes, stones, mud, sand, reservoir rocks of water bodies lake.

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MATERIALS AND METHODS

Study Site

Nizamabad district lies between 18° 40' and 19° 00' North latitude and between 78° 10' and 79° 10' East longitude .Density is 321km^2 Area 7956. The district is rich source of rivers, lakes, ponds and reservoirs. The lake, selected for the present investigation is located nearby Telangana University, Amruthapur village, Dichpally mandal of Nizamabad district (Figure –I).

Figure 1. Over view of Amruthapur lake

Sample collection

The Lake is almost dry in summer season (April & May) but gets filled up during monsoon. This is also one of the major causes for the loss of aquatic biodiversity in the Lake Ecosystem, while appearance-disappearance of the species is subject to seasonal changes.

For phytoplanktonic studies 100 litres of water sample were collected from different sites of the lake, filtered through plankton net of bolting silk having 173 meshes per linear inch and these samples were fixed and preserved in 4% formalin fur further observation. Identification was done by making use of keys, standard literature, monograph (Desikachary, 1959; Fritsch, 1935; Prescott, 1951). The aquatic macrophytes were hand pulled, collected into large polythene covers and were brought to the laboratory. These specimens were washed, dipped in 2% mercuric chloride, dried and were pressed on herbarium sheets, following standard herbarium techniques. The aquatic macrophytes were further identified with the help of available literature of Subramanyam, 1962; Jain and Rao, 1976; Varma, 1981; Cook, 1996; Majid, 2000 and Choudary, 2002. A phytoplankton investigation of the lake ecosystem was mainly carried over two different seasons (January to March 2014 and August to October, 2015). It has been confirmed that Amruthapur lake is not only suitable for growth of algal species but also provides shelter for birds with abundant occurrence of aquatic plant species

Table 1. Seasonal variation of Phytoplanktonic distribution in Amruthapur pond during the study period

S.N	Name of the species	Class	Season -1 (August-November)			Season-2 (Jan - March)		
			Study sites					
			S-1	S-2	S-3	S-1	S-2	S-3
1.	*Spirogyra spp,*	*Chlorophyceae*	++	++	+	-	+	-
2.	*Pediastrum duplex*	*chlorophyceae*	+	+	+	-	+	-
3.	*Chlorella vulgaris*	*Chlorophyceae*	+	-	-	+	+	+
4	*Scenidesmus accuminatus*	*Chlorophyceae*	+	+	-	+	+	-
5.	*Hydrodictyon reticulatum*	*Chlorophyceae*	++	+	+	+	+	+
6	*Pandorina morum*	*Chlorophyceae*	+	+	+	-	-	+
7.	*Chlamydomonas*	*Chlorophyceae*	+	+	+	+	+	-
8.	*Cosmarium corda*	*Chlorophyceae*	-	-	+	++	+	++
9.	*Cladophora*	*Chlorophyceae*	++	++	++	-	-	-
10.	*Zygnema khanne skuja*	*Chlorophyceae*	+	+	-	-	+	+
11	*Pediastrum simplex*	*Chlorophyceae*	-	+	+	+	++	++
12	*Oocystis spp.*	*Chlorophyceae*	+	+	+	+	-	+
13	*Volvox spp.*	*Chlorophyceae*	+	+	+	+	+	+
14	*Closterium acutum*	*Chlorophyceae*	-	-	-	+	++	+
15	*Closterium moniliferum*	*Chlorophyceae*	-	-	-	++	++	+
16	*Closterium costatum*	*Chlorophyceae*	-	-	+	+	+	+
17	*Desmidium grevillii.*	*Chlorophyceae*	+	+	+	+	+	++
18	*Pandorina morum*	*Chlorophyceae*	+	+	+	+	+	+
19	*Cosmarium cyclecum*	*Chlorophyceae*	-	-	+	+	++	+
20	*Oedogonium spp.*	*Chlorophyceae*	+	+	+	+	+	+
21.	*Synedra ulna*	*Bacillariophyceae*	+	+	+	+	+	+
22.	*Nitzschia closterium*	*Bacillariophyceae*	-	-	-	+	+	+
23	*Nitzschia acicularis*	*Bacillariophyceae*	+	-	+	+	+	+
24.	*Nitzschia paradoxa*	*Bacillariophyceae*	+	+	+	-	-	-
25.	*Pinnularia viroidis*	*Bacillariophyceae*	+	+	-	+	+	+
26.	*Pinnularia tabulate.*	*Bacillariophyceae*	+	+	+	-	-	-
27.	*Cyclotella spp,*	*Bacillariophyceae*	-	+	+	-	+	-
28.	*Navicula cuspidate,*	*Bacillariophyceae*	+	+	-	+	+	-
29.	*Pinnularis gibba*	*Bacillariophyceae*	+	+	+	+	+	+
30.	*Cymbella affinis*	*Bacillariophyceae*	+	-	-	+	-	-
31	*Melosira spp.*	*Bacillariophyceae*	-	-	-	++	+	++
32.	*Gloecapsa spp*	*Cyanophyceae*	-	-	-	++	+	+
33.	*Microcystis aeruginosa,*	*Cyanophyceae*	+	+	+	-	+	+
34.	*Anabaena spp*	*Cyanophyceae*	+	+	++	++	+	++
35.	*Oscillatoria spp.*	*Cyanophyceae*	+	+	+	+	+	+
36.	*Nostoc,*	*Cyanophyceae*	-	-	-	++	+	++
37.	*Spirulina spp.*	*Cyanophyceae*	+	-	+	-	+	+
38.	*Cylindrospermum spp,*	*Cyanophyceae*	+	+	+	+	-	+
39.	*Scytonema spp.*	*Cyanophyceae*	+	+	-	+	+	++
40.	*Lyngbya major*	*Cyanophyceae*	+	-	+	+	+	+
41.	*Chara coralina*	*Charophyceae*	++	++	+	+	+	+
42.	*Nitella merabilis*	*Charophyceae*	++	++	+	++	+	++

RESULTS AND DISCUSSION

A Phytoplankton inventory was carried out in Amruthapur lake mainly over two different seasons, (January to March and August to October) during the year 2014-15. A total of 42 Algal species were recorded belonging to 4 different classes, namely *Bacillariophyceae, Chlorophyceae, Cyanophyceae, Charophyceae* as presented in Table-1. Out of 42, most of the species belong to class *Chlorophyceae* (20), followed by *Bacillariophyceae* (11) *Cyanophyceae* (9) *and Charophyceae* (2). Under Bacillariophyceae eight (11) species were recorded namely *Synedra ulna, Melosira granulate, Nitzschia closterium, Nitzschia paradoxa*. Out of these three species (Synedra ulna Var. amphirhynchus) were recorded over both the seasons; *Nitzschia paradoxa* was recorded post Season-1, While *Melosira granulate, Synedra ulna, Nitzschia closterium* and *Synedra ulna Var. oxyrynchus* were recorded in Season-2. (August – November Season-1) and (January- March Season-2).

The species namely *Cladophora glomerata, Zygnema khanne, Spirogyra hyaline, Spirogyra condensate, Cosmarium innae, Pediastrum duplex, Pediastrum simplex Oocystis spp. Chlorella, Scenidesmus, Volvox spp. Closterium acutum, Hydrodictyon spp,. Pandorena, Closterium moniliferum, Closterium costatum, Oedogonium spp. Chlamydomonas, Cosmarium cyclecum Pandorina morum Desmidium grevillii* belong to class *Chlorophyceae.* Under *Chlorophyceae* species *(Cladophora glomerata, Spirogyra condensate*) were observed during Season-1 and two species *(Cosmarium innae Closterium spp.*) was found in Season-2 and remaining species *Zygnema khanne, Spirogyra hyaline, Cladophora, Oedogonium* etc. were recorded over both the seasons. Under class *Cyanophyceae,* (9) species namely *Lyngbya majuscule, Gleocapsa punctata, Nostoc piscinale, Oscillatoria tenuis Mycrosystis, Anabaena, Spirulina, Scytonema* and *Cylindrospermum* spp. were recorded during the study period.

Table 2. Aquatic macrophytes during the study period in Amruthapur lake

S.n	*Name of the species*	*Family*	Habitat	Season-1	Season-2
1.	*Azolla pinnata R. Brown.*	*Salviniaceae*	Free floating	++	+
2.	*Nymphea pubescence*	*Nymphaeaceae*	Free floating	-	+
3.	*Lemna minor Linn.*	*Lemnaceae*	Free floating	+	+
4.	*Eichhornia crassipes*	*Pontederiaceae*	Free floating	+	+
5.	*Pistia stratoites Linn.*	*Araceae*	Free floating	+	+
6.	*Nelumbo nucifera*	*Nelumbonaceae*	Free floating	+	+
7.	*Salvinia auriculata Linn.*	*Salviniaceae*	Free floating	+	+
8.	*Vallisnaria natans Linn.*	*Hydrocharitaceae*	Submerged	-	++
9.	*Potamogeton pectinatus Mique*	*Potamogetonaceae*	Submerged	+	-
10.	*Hydrilla vercillata Linn.*	*Hydrocharitaceae*	Submerged	++	++
11.	*Otellia alsinoides Linn.*	*Hydrocharitaceae*	Submerged	-	+
12.	*Nechamandra alternifolia*	*Hydrocharitaceae*	Submerged	-	+
13	*Hygrophilla schulli*	*Acanthaceae*	Emergent	+	+
14.	*Panicum miliaceum L inn*	*Poaceae*	Emergent	+	+
15	*Cyperus rotundus Linn*	*Cyperaceae*	Emergent	++	++
16.	*Typha angustifolia Linn*	Typhaceae	Emergent	+	+
17.	*Polygonum glabrum Willd*	*Polygonaceae*	Emergent	+	-
18.	*Marselia quadrifolia Linn*	*Marseliaceae*	Emergent	+	+
19.	*Ipomea aquatica*	*Convovulaceae*	Emergent	-	++
20.	*Ipomea carnia*	*Convolvulaceae*	Emergent	-	++

(-)= Absent (+)= Present (++)=Most abundant

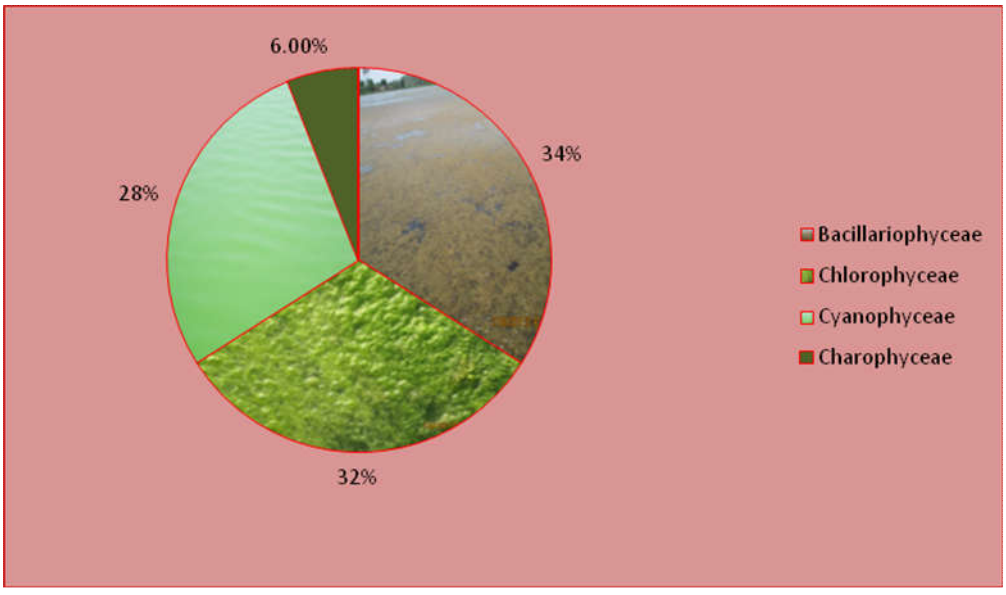

Figure 1. Graphical representation

All species were found to be available in Season-1, however, only three species, *Gleocapsa punctata*, *Anabaena, Nostoc* were recorded in Season-2. Under class *Charophyceae,* two species (*Chara sp. Nitella* spread throughout the ponds) was recorded during the study period. The presence of species during the both seasons and at various sample collection points are presented in Table-1.

In this investigation abundance of macrophytes also were recorded grouped under different categories, i.e. floating, submerged and emergent forms based on habitat status. It was observed that emergent forms were dominant when compared to free floating forms and submerged forms were poor in distribution. Scientific name, common name, family name habitat status and presence or absence in four different lakes is shown in Table-II. Graphical representation showing percentage of algal genera belonging to *Bacillariophyceae, Chlorophyceae, Cyanophyceae Charophyceae* is presented in Figure-3.

Graphical representation

Conclusion

Wetland ecosystems are the primary shelter for aquatic biodiversity including aquatic flora, fauna and other microorganisms. Phytoplankton is one of the important components of aquatic ecosystems. Fresh water ponds play an important role in the social ecology of the region in which they are located. The lakes located in the human dominating areas are facing a threat due to various factors including anthropogenic activities, for example, bathing, washing clothes, cleaning animals and vehicles, dumping solid waste etc. Such activities, in turn, lead to the loss of aquatic biodiversity, especially plankton diversity. The present study area falls under a semiarid region; generally semiarid regions are highly vulnerable to climatic factors such as high temperatures and less rainfall. Due to less rainfall and high temperatures as well as increased anthropogenic activities in the study area, the water bodies are in jeopardy. In the study region, we conducted extensive field survey; of the total number of species documented 42 belong to four classes and 20 aquatic macrophytes belonging to different categories were recorded. The increase and decrease species diversity during summer and monsoon seasons may be due seasonal changes as well as water movement. However, there are some studies that indicate that, the species diversity is high across other lake ecosystems.

Acknowledgement

We express our deep sense of gratitude to Prof. VIDYAVATI, Former Vice-Chancellor of Kakatiya University, Warangal, Telangana State for her valuable suggestions and constant encouragement.

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